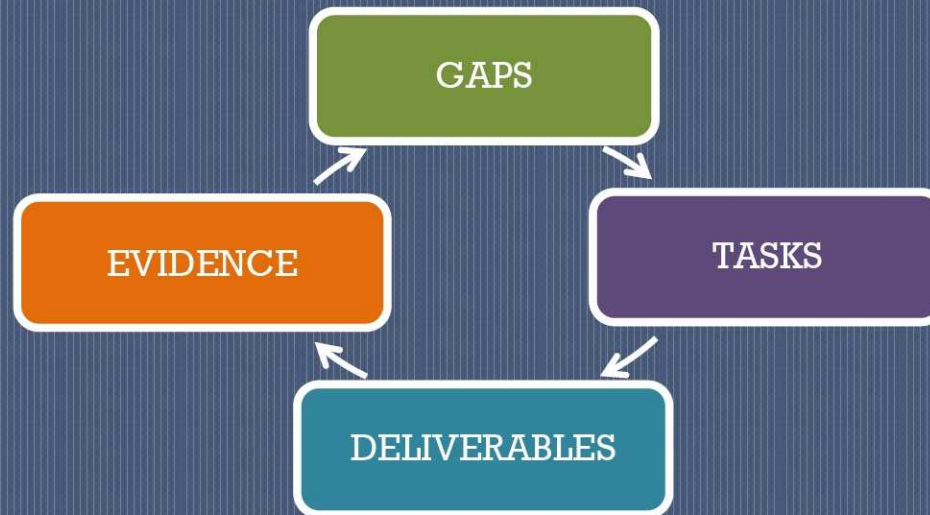


Life Sciences Data Archive (LSDA) in the Post-Shuttle Era

Data management, including issues related to archiving and accessing data and physical samples from ground and flight studies, is an important component of the Human Research Program. In accordance with the National Aeronautics and Space Act of 1958, as amended, all research data gathered under the HRP will be made publicly available in a non-attributable form. HRP policy dictates this will take place within one year of the completion of data collection. (HRP Science Management Plan)



In spaceflight, there is a large amount of data generated to understand and monitor the health and safety of the crewmember. Because of the large volume of data, a data management infrastructure needs to be deployed to allow users access to the data. The system needs to be available, secure, and ensure data integrity. This way users can gain valuable insight into health and safety of the crew to maintain their health status and ensure mission success.

Identifying the Gaps in the LSDA

GAPS

The HRP uses various research platforms and data sources to address gaps in knowledge. Historical data derived from ground and spaceflight studies form the basis of the HRP Evidence Reports, with the intention of ensuring that the HRP does not duplicate effort already expended. The Evidence Book, a compilation of all the evidence-based risk reports, makes important data accessible and available for periodic review.

The LSDA is employing a systematic approach to identifying any gaps between it's holdings and the Evidence Reports. In order to ensure that these data, and relevant information, is archived in a centrally located, accessible database.



Gap Analysis Approach

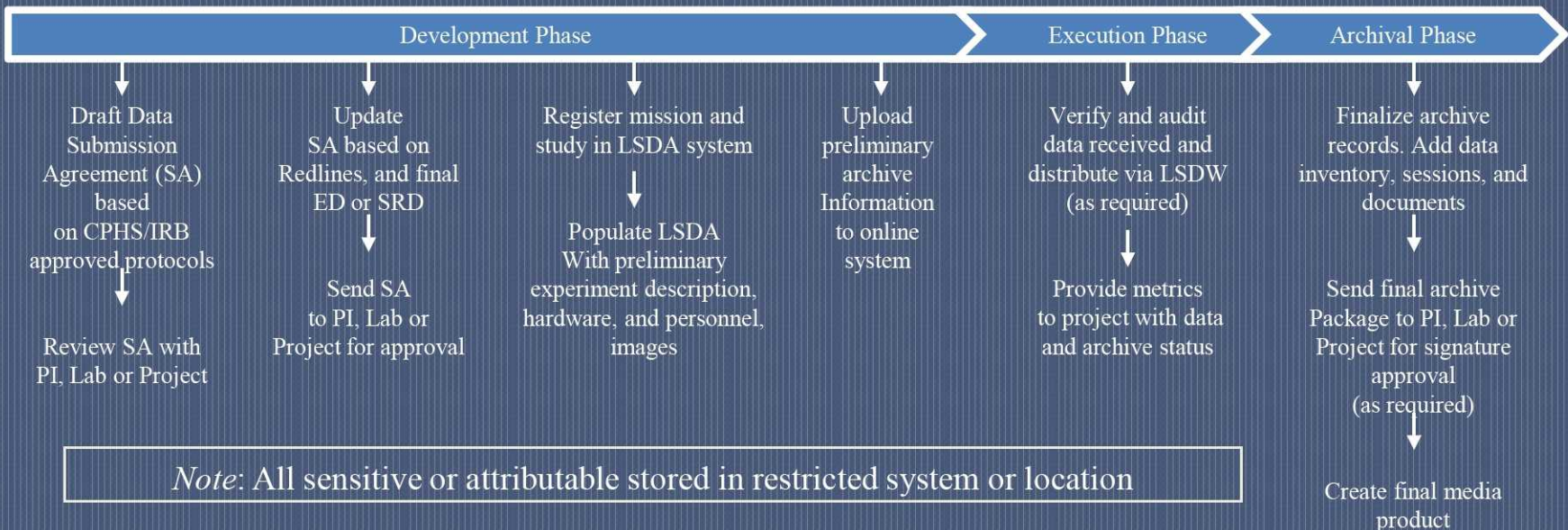
- Step 1: Compile list of all current experiments in LSDA holdings for specific Element/Project/Discipline
- Step 2: Perform gap analysis of LSDA holdings against Evidence Book and Task Book
- Step 3: Compile gap analysis chart
- Step 4: Meet with Element/Discipline/Project to review gap analysis and develop a forward archival plan
- Step 5: Develop an effective method of reporting progress (metrics)

Providing Enabling Capabilities

TASKS

The Life Sciences Data Archive (LSDA) provides a system to capture and disseminate life science research findings. It currently contains summarized descriptions of flight and ground experiment research results with references to publications, as well as raw data files from flight. Data management and distribution capabilities are also available within the LSDA system and may be used to collect structured data for experiments, distribute that data, and archive experiment data for future use. (HRP Program Plan)

LSDA Archive Process



Biospecimen Sharing Program

TASKS

DELIVERABLES

Biospecimen Sharing provides the scientific community with access to NASA's inventory of biological materials from organisms that have flown in space or from related ground control studies. Applicants may submit proposals specifically for analysis of materials obtained from this Program or as an adjunct or supplementary component of an experiment proposal in another research area. Acceptance of materials commits the requestor to provide NASA with results of the study. These products should include electronic submissions of raw and analyzed data and a final report for archival by the Life Sciences Data Archive project (<http://lsda.jsc.nasa.gov>).

Any publications resulting from the study should be appropriately attributed to NASA. The materials remain the property of NASA, can only be used for the approved purpose, and unused portions of the biospecimens must be returned to NASA at the conclusion of the study.

For information on current NASA Research Opportunities/Solicitations visit <http://nspires.nasaprs.com/external/>

To request biospecimens for research, submit a proposal to NASA suitable for peer review. For information on how to prepare and submit an unsolicited proposal visit: http://prod.nais.nasa.gov/cgi-bin/nais/nasa_ref.cgi



Biospecimen Tissue Request

TASKS

DELIVERABLES

Surplus (unassigned) biospecimens from flight missions are available for research. The instructions for obtaining biospecimens are available online.



Experiment



Mission



Personnel



Biospecimens



Documents



Hardware



Dataset



Photo Gallery

FULL TEXT SEARCH RESULT: BIOSPECIMENS

Results for: All Words

- muscle

Below is a list of **332** biospecimens that meet these criteria.

Biospecimen Unassigned: Found 54

Biospecimen Assigned: Found 278

Unassigned

54 "Unassigned". These tissues are available for research. [+ Tissue Requests](#)

Name	Species	Collection Phase / Day	Session Type
Kidney- z	Rat	Postflight / R+ML	Flight
Duodenum- rt	Rat	Postflight / L+0	Basal Delayed Flight Profile Test (DFPT)
Duodenum- f	Rat	Postflight / L+0	Basal Delayed Flight Profile Test (DFPT)
Ileum- rt	Rat	Postflight / L+0	Basal Delayed Flight Profile Test (DFPT)
Ileum- f	Rat	Postflight / L+0	Basal Delayed Flight Profile Test (DFPT)
Jejunum- rt	Rat	Postflight / L+0	Basal Delayed Flight Profile Test (DFPT)
Jejunum- f	Rat	Postflight / L+0	Basal Delayed Flight Profile Test (DFPT)

Shuttle Data Archive Project

TASKS

In FY 2009, NASA/JSC began developing a Shuttle Data Archive repository. The Shuttle program is nearing its end in 2010 and it is critical that the medical and research data related to the Shuttle program be captured, retained, and usable for research, lessons learned, and future mission planning.

As part of this effort, the LSDA has responsibility for archival of the Detailed Supplementary Objectives (DSOs). This was a major gap identified in the archive. Information on many of these historical studies is difficult to find and results of many were not published for various reasons. However, this is an important data set that must be preserved. LSDA has made great progress over the past year archiving these studies.

Record Type	# Complete	# of DSOs	% Complete	Comments
Study Description	99	119	83%	Need FTSODs for remaining 10 experiments to populate descriptions
Personnel	94	119	79%	Need FTSODs for remaining 10 experiments to populate personnel
Hardware	76	85	89%	34 DSOs do not have hardware
Images	29	46	60%	73 DSOs do not have images
Data Cataloged	49	84	58%	35 DSOs do not have data
Data Online	32	84	38%	Uploaded to online or restricted websites
Total DSOs Completed	8	119	7%	All information archived and online

Home Page Access to New or Updated Content

DELIVERABLES

Provide data integration and management for HRP to ensure proper handling of data (e.g. Life Sciences Data Archive, Mission Extended Medical Enterprise). Gaps exist where these capabilities are either insufficient or incomplete.

New Experiments

RSS

- + Consequences of Long-term Confinement and Hypobaric Hypoxia on Immunity in the Antarctic Concordia Environment (CHOICE)
- + Dietary Intake Can Predict and Protect Against Changes in Bone Metabolism During Space Flight and Recovery (ProK)
- + Evaluation of Maximal Oxygen Consumption (VO2PK) Protocols for Determining Ventilatory Threshold (EORS_VT)
- + The Evaluation of Concentric and Eccentric Skeletal Muscle Contractions Following Space Flight (DSO 477)
- + Validation of Improved Comfort and Loading with the Center for Space Medicine (CSM) Harness (SDTO_17013_U)
- + Validation of On-Orbit Methodology for the Assessment of Cardiac Function and Changes in the Circulating Volume Using Ultrasound (SDTO_17011_UR)

New Content

This module displays new content without the need to conduct a search.

*Users can also subscribe to the **RSS** feed to have new content delivered to their email Inboxes. The frequency is user defined.*

Home Page Access to New Data

DELIVERABLES

- ❑ Newly added datasets are displayed on the home page.
- ❑ This enables the user to view new datasets without searching
- ❑ Selecting any of the links takes you directly to that dataset.
- ❑ Restricted dataset catalog available to JSC researchers

New Data

- + Femur Measurements, Research Animal Holding Facility (RAHF)
Delayed Flight Profile Test (DFPT) animals - STS-40 - Experiment ID: 178194 1/2
- + Mid Endosteal Tibia Measurements - STS-40 - Experiment ID: 178194 1/2
- + Rodent Body Weights - STS-40 - Experiment ID: 178194 1/2
- + SLS-1 (Day 156) RAHF, Engineering Parameters Spreadsheet from the Inflight Research Animal Holding Facility, Julian Day 156 - STS-40 - Experiment ID: 178238 1/2
- + SLS-1 Onboard Film - STS-40 - Experiment ID: 178238 1/2

Access to data is critically important to advancing the state of knowledge of the human system in space. A data integration and management function includes the proper archiving of historical research data (e.g. The Life Science Data Archive), and organizing medical and research data to provide proper security levels, allow queriable access, and to provide tools to allow analysis of evidence (e.g. Integrated Medical Model). (HRP Program Requirements Document)

Medical Requirements and Data Request Form

DELIVERABLES

The Medical Requirements (MRIDs) are now posted on the LSDA public website. Users can Select from any of the discipline areas to see what medical tests are performed. The process for requesting data , along with data request form, are available on this page.

The screenshot shows the NASA Life Sciences Data Archive (LSDA) website. The top navigation bar includes links for HOME, RESEARCH, SEARCH DATABASE, TISSUE REQUEST, JUST FOR FUN, READING ROOM, and MEDICAL. Below the navigation bar is a search bar with the text "Life Sciences Data Archive @ Johnson Space Center, Houston, Texas" and a "Search" button. The main content area features a "NASA MEDICAL" header with three small images. Below the header, there is a section titled "+ View MRID overview or Click on an category image for relevant MRID information:". This section contains a grid of colored boxes with icons and text labels for various medical categories: Behavioral Health and Performance, Bone, Muscle, Exercise, Cardiovascular, Environmental Health, Extravehicular Activity (EVA), Immunology, Neurology, Nutrition, Radiation, Therapeutics and Clinical Care, and View All Medical Requirements. At the bottom of the page, there are two links: "+ Request form for LSAH MRID data" (circled in red) and "+ Crew HealthCare System catalog".

NASA
MEDICAL

+ View MRID overview or Click on an category image for relevant MRID information:

Behavioral Health and Performance	Bone, Muscle, Exercise	Cardiovascular
Environmental Health	Extravehicular Activity (EVA)	Immunology
Neurology	Nutrition	Radiation
Therapeutics and Clinical Care	View All Medical Requirements	

+ Request form for LSAH MRID data

+ Crew HealthCare System catalog

Knowledge Discovery: Concept Searches

EVIDENCE

LSDA is engaged in a pilot project with Collexis, a new type of Web-based search engine.

Collexis Mediator

- NASA's space life sciences evidence base changes over time. Information may be difficult to access due to security/access requirements, data formats and storage locations.
- Collexis may address these issues by virtue of its retrieval and discovery capabilities across silos
- Collexis differentiates itself from full-text search engines by making use of thesauri for information retrieval and a unique matching technology

The screenshot displays the Collexis Mediator search interface. At the top, there are two tabs: 'term search' (selected) and 'search with document'. Below the tabs, a search query 'audiometry' is entered in a text box, and a dropdown menu shows 'Search query in: English'. A button labeled 'analyse' is next to the search box. Below the search box, a 'Collexis® Search Fingerprint' is displayed, stating 'Based on UMLS "Audiometry"' and 'Based on full text: "----"'. Below the fingerprint, there are several tabs for different search categories: 'LSDA (up to Dec 09)', 'Medline 2000-2009', 'Medline 1986-1999', 'Medline 1949-1985', 'CRISP', and 'Clinical Trials'. Under the 'LSDA (up to Dec 09)' tab, there are sub-tabs: 'Experiments', 'Experts (?)', and 'Semantic analysis (?)'. A 'search title' text box and a 'create agent' button are also present. Below the tabs, the results are shown under the heading 'found: 4'. The results are listed in a table with columns for 'Experiments (LSDA (up to Dec 09))' and 'Related concepts'. The first four results are:

Experiments (LSDA (up to Dec 09))	Related concepts
1. 100 % Overlap: 1/1 Otoacoustic Hearing Assessment [similar content]	Diseases & Pathologic Processes Deafness Anoxia Space Motion Sickness Hearing Loss
2. 100 % Overlap: 1/1 Acoustic Noise During the Phase III Chamber Test [similar content]	Chemicals & Drugs Vehicles Water
3. 100 % Overlap: 1/1 Audiometry [similar content]	Procedures Acoustic Impedance Tests Otoscopy Valsalva Maneuver Pure-Tone Audiometry Reading Hearing Tests
4. 51 % Overlap: 1/1 NAG91387	Anatomy

Knowledge Discovery: Relevance Visualization

EVIDENCE

term search search with document

Search query in: English

audiometry analyse

from 2000 to 2009

Collexis® Search Fingerprint:
Based on UMLS "Audiometry"
Based on full text: "—"

LSDA (up to Dec 09) **Medline 2000-2009** Medline 1986-1999 Medline 1949-1985 CRISP Clinical Trials

Publications Experts (?) Organizations Semantic analysis (?) search title create agent

found: 6267

Number of publications for search items per annum

586	570	570	573	676	716	718	731	808	319
2000	2001	2002	2003	2004	2005	2006	2007	2008	2009

Publications (Medline 2000-2009)

1. **Collexis** 100 % Overlap: 1/1

2009: Bendixen Alexandra; Schröger Erich; Winkler István
I heard that coming: event-related potential evidence for stimulus-driven prediction in the auditory system.
The Journal of neuroscience : the official journal of the Society for Neuroscience; 29(26):8447-51

Related concepts
Click name to add concept to your search

- Diseases & Pathologic Processes
 - Hearing Loss
 - Functional Laterality
 - Sensorineural Hearing Loss
 - Tinnitus
 - Deafness

User Interface
provides
Relevance
Visualization

Knowledge Discovery: BioMed Experts

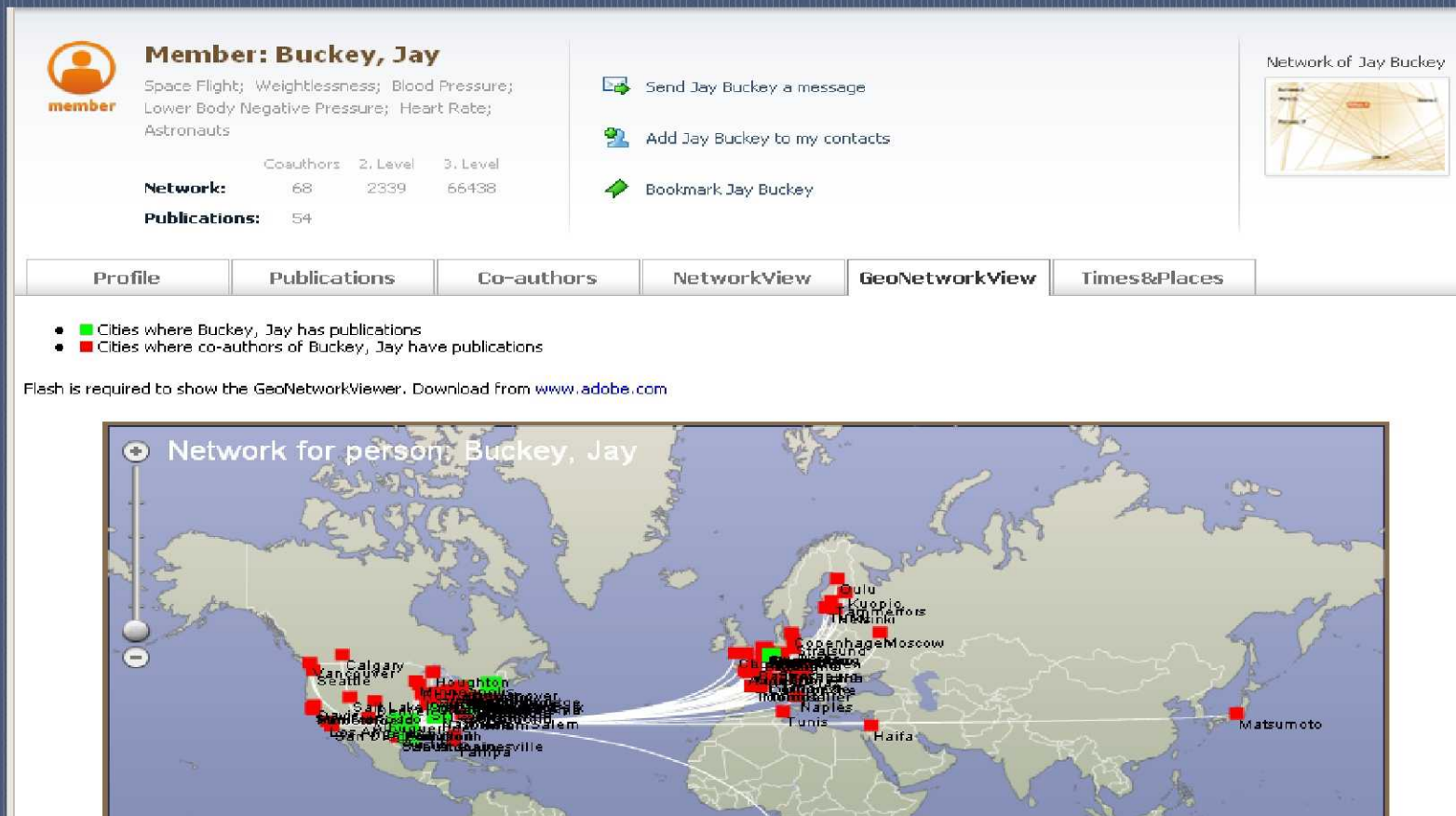
EVIDENCE

The Biomed Expert module allows users to locate other experts in their research area:

Institution

Geographic Location

Associated Publications



Life Sciences Data Archive (LSDA) in the Post-Shuttle Era

M. Fitts¹, K. Johnson-Throop¹, J. Havelka², D. Thomas²

¹NASA Johnson Space Center (JSC). ²Lockheed Martin

ABSTRACT

Now, more than ever before, NASA is realizing the value and importance of their intellectual assets. Principles of knowledge management – the systematic use and reuse of information, experience, and expertise to achieve a specific goal – are being applied throughout the agency.

LSDA is also applying these solutions, which rely on a combination of content and collaboration technologies, to enable research teams to create, capture, share, and harness knowledge to do the things they do well, even better.

In the early days of spaceflight, space life sciences data were collected and stored in numerous databases, formats, media-types and geographical locations. These data were largely unknown/unavailable to the research community. The Biomedical Informatics and Health Care Systems Branch of the Space Life Sciences Directorate at JSC and the Data Archive Project at ARC, with funding from the Human Research Program through the Exploration Medical Capability Element, are fulfilling these requirements through the systematic population of the Life Sciences Data Archive. This project constitutes a formal system for the acquisition, archival and distribution of data for HRP-related experiments and investigations. The general goal of the archive is to acquire, preserve, and distribute these data and be responsive to inquiries from the science communities.

Information about experiments and data, as well as non-attributable human data and data from other species' are available on our public Web site <http://lsda.jsc.nasa.gov>. The Web site also includes a repository for biospecimens, and a utilization process.

Life Sciences Data Archive (LSDA) in the Post-Shuttle Era

M. Fitts¹, K. Johnson-Throop¹, J. Havelka², D. Thomas²

¹NASA Johnson Space Center (JSC). ²Lockheed Martin

ABSTRACT (continued)

NASA has undertaken an initiative to develop a Shuttle Data Archive repository. The Shuttle program is nearing its end in 2010 and it is critical that the medical and research data related to the Shuttle program be captured, retained, and usable for research, lessons learned, and future mission planning.

Communities of practice are groups of people who share a concern or a passion for something they do, and learn how to do it better as they interact regularly. LSDA works with the HRP community of practice to ensure that we are preserving the relevant research and data they need in the LSDA repository.

An evidence-based approach to risk management is required in space life sciences. Evidence changes over time. LSDA has a pilot project with Collexis, a new type of Web-based search engine. Collexis differentiates itself from full-text search engines by making use of thesauri for information retrieval. The high-quality search is based on semantics that have been defined in a life sciences ontology. Additionally, Collexis' matching technology is unique, allowing discovery of partially matching documents. Users do not have to construct a complicated (Boolean) search query, but can simply enter a free text search without the risk of getting "no results". Collexis may address these issues by virtue of its retrieval and discovery capabilities across multiple repositories.

In summary, the LSDA was developed to ensure that the scientific community and the public have access to the results of NASA-related Life Sciences Data. This is mandated by policies and guidelines which promote the development and evolution of such an archive.